

Master Lumi 2018 – presentation October 23, 2017

# Light waves in complex media: from biological tissues to cold atoms

Arthur Goetschy  
Romain Pierrat

Institut Langevin, ESPCI, Paris, CNRS



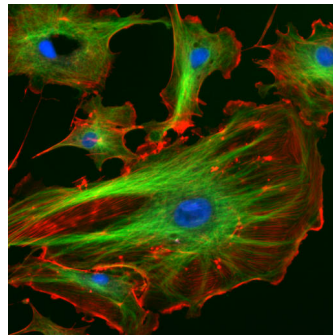
Institut **Langevin**  
ONDES ET IMAGES

**UPMC**  
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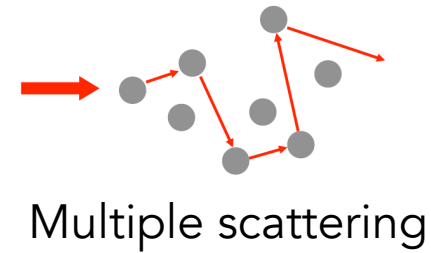
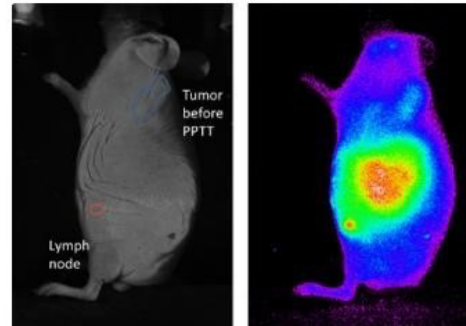
ESPCI  PARIS

# The challenge of "seeing through scattering media"

In vitro

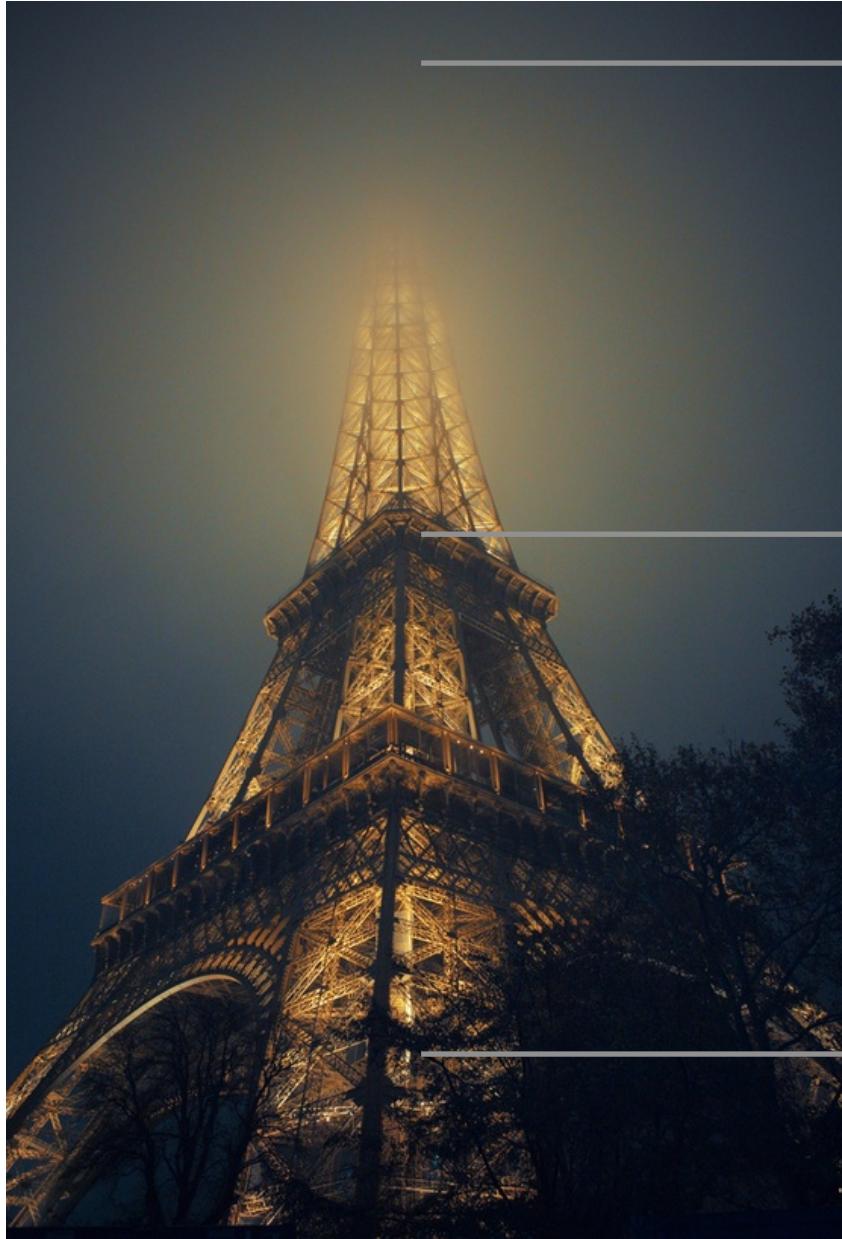


In vivo



- (1) How can we describe wave propagation in complex environments ?
- (2) How to extract an image/information despite disorder ?
- (3) How to take advantage of the degrees of freedom of complex systems to achieve new functionalities ?

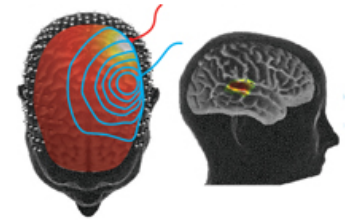
# Transport regimes and imaging modalities



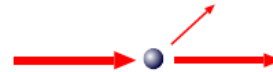
Multiple scattering



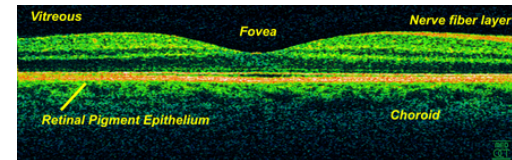
Opt. diffuse tomography



Single scattering



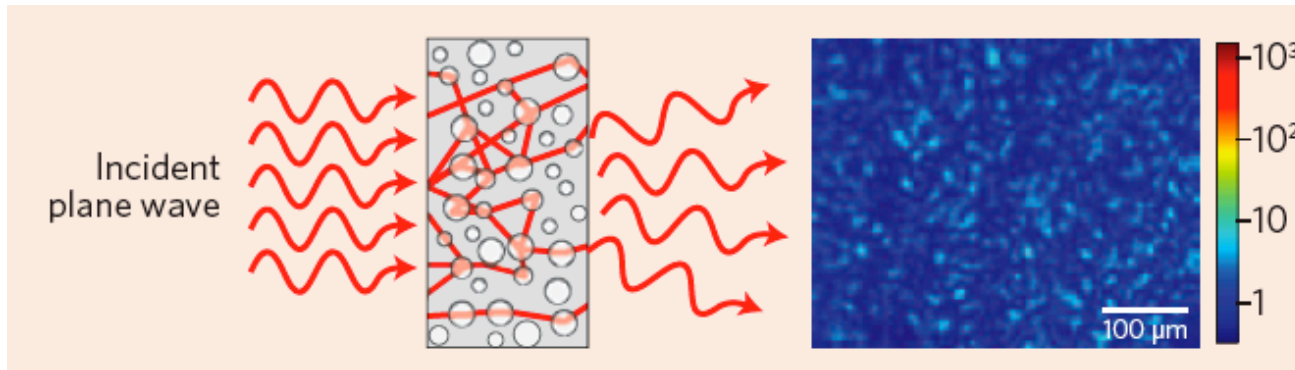
Opt. coherence tomography



Ballistic propagation

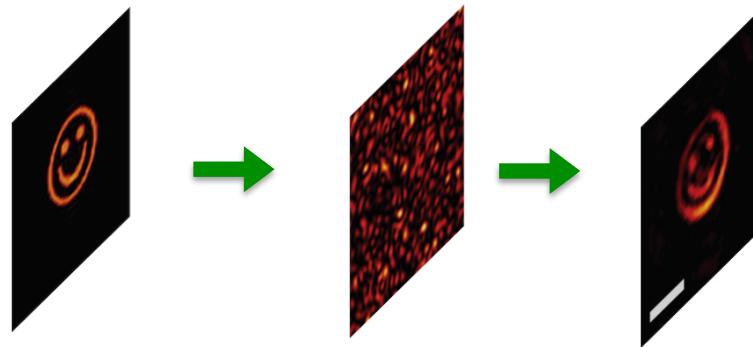


# Coherent effects and imaging modalities

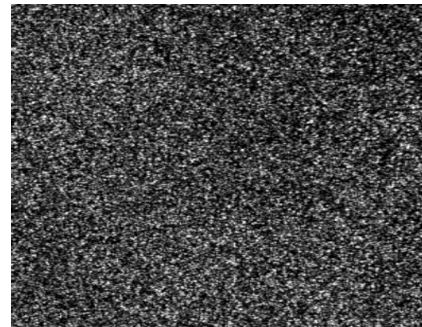


Speckle

How to recover an object hidden behind an opaque medium from the speckle ?

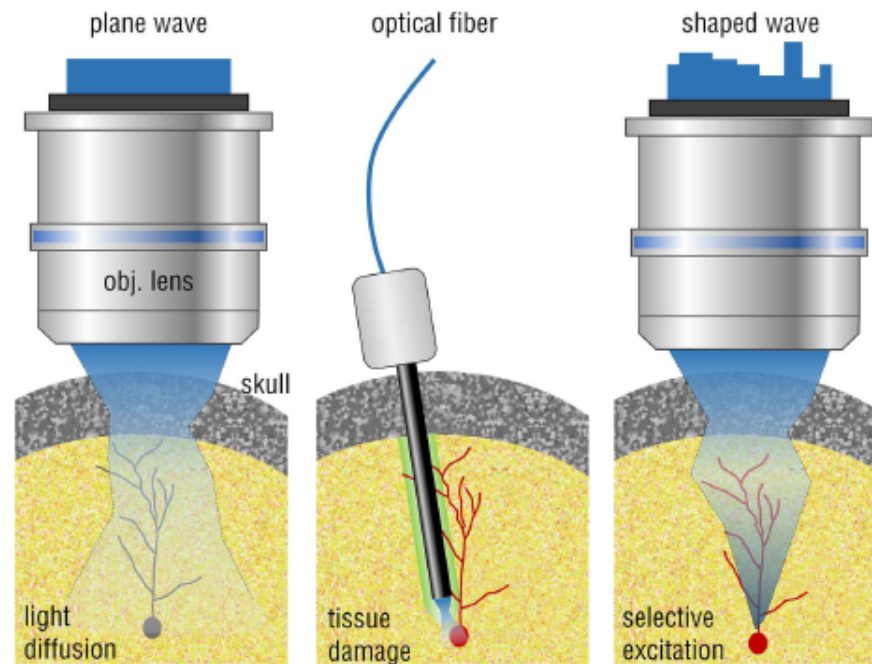
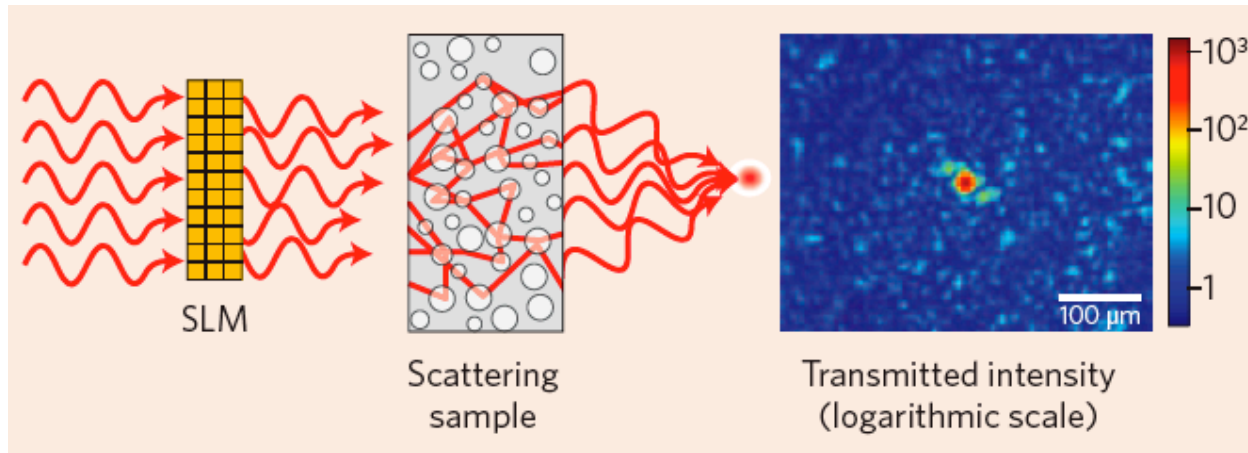


Diffusing wave spectroscopy  
(functional imaging)



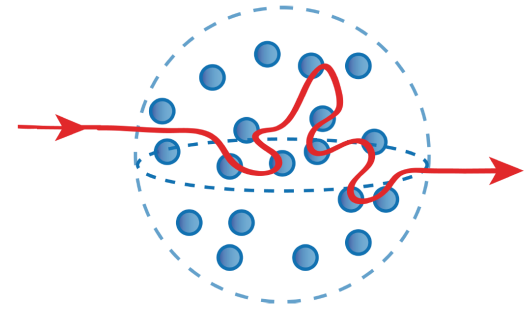
Access to dynamic  
properties of the  
medium

# Wavefront shaping: an ongoing revolution !

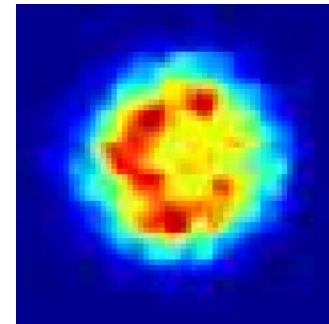


# Light and cold atomic gases

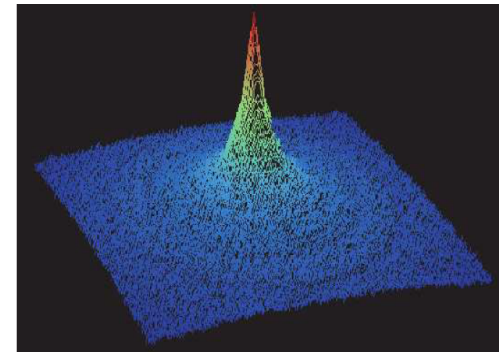
Radiation trapping due to resonant atoms



Flash effect in temporal transmission



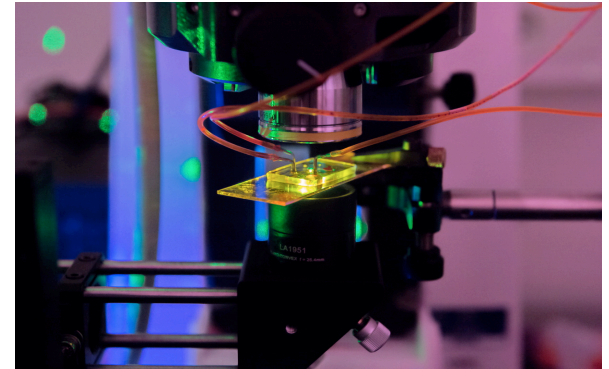
Wave localization and coherent backscattering



# Organization

## Schedule

28 hours of lectures with 4 tutorials  
Thursday afternoon, January-February  
Laboratory visit (optional)



## Exam

Oral

## Location

UPMC, Paris



## Language

English or french